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vapors could keep suspended a very great and weighty Circle of Ice, such as M. *Des-Cartes* supposeth to explicate the cause of *Parhelia's* and of the great White Circle of the Roman *Phanomenon*. In which supposition were also to be noted the following difficulties; *viz.* *That* therein there appears no reason, why the White Circle should pass through the Sun, as is always observed, and that it should shade him according as he changes in height, though the *Phanomenon* do sometimes last three or four hours: *That* this same White Circle, formed of Ice, being seen by Spectators distant enough from one another, could not appear round to all (as it doth) and to traverse the Sun: *That*, when *Parhelia* are observed, there appears not at all this round Cloud encompassed with the Icy Circle, which by its thickness should hide a part of the Heavens; but that the Weather seems almost altogether serene, there being none but small clouds, which are seen to change places, whilst the great Circle and the *Parhelia* remain at rest. *That* in this Hypothesis it happens not but by chance, that the *Parhelia*, which are at the side of the Sun, appear in the Intersections of an *Halo* and of the great White Circle; which yet is observed to come to pass always, and shews, that the Causes of these *Halo's* and of the *Parhelia* are very little different, against the opinion of M. *Des Cartes*.

A Discourse of Dr R. Wittie, relating to the Notes of Dr Foot in Numb. 52. and to those of Dr. Highmore in Numb. 56. of these Tracts; concerning Mineral Waters, and Extracts made out of them: Communicated to the Publisher, by way of Letter.

Sir,

I Must always acknowledg myself much obliged to you for the reiterated mention you have been pleased to make of my Book in your *Transactions*, and your patient condescension to the trouble, that hath ensued therefrom to you, whereas I could not have any ground of hope, that any thing of mine should have fallen under your notice. And this goodness of yours gives me encouragement to presume at this time to desire your favor in the perusal of these lines, which are occasioned

oned from some Observations, I have met with in your said *Transactions*, referring to my subject.

And *First*, in No. 51. p. 1039 l. 40. in mentioning the Principles of *Scarborough-water*, there was pretermitted *Vitriol*, which I suppose was not designedly done. This I was to premise, because some things that follow do refer to that Mineral.

Next, I cannot but take notice of D. *Foot's* ingenious Notes and Letter in your *Numb. 52.* p. 1050: which he grounds upon your enlarged Account of my Book, about the Volatil parts of Mineral waters, together with his *Queries*. To all which though I might have returned a speedy Answer from old Observations, yet I was willing to stay, till my occasions could permit me to step over to *Scarborough* to renew my Experiments; wherein as I resolved to be more Critical, so I hope my return will be more satisfactory to all, that are concerned.

As for *Tachenius*, to whom he refers, I cannot get him in *London*, and therefore can say nothing to his Principles. It is certain, that these sorts of Mineral waters are more pleasant to the palate, and also more effectual, if they be drunk at the Fountains, then when carried at distance: Yet some of them will endure carriage much better than others. Such of them, as are impregnated with a body of Minerals, as *Scarborough*, *Malton*, and the *Sulphur-well* at *Knaresbrough*, will better indure carriage than the *Sweet-weell* at *Knares-brough*, and the *Sauvenir* in *Germany* &c. which have imbibed little or nothing but the Volatil Spirits or Vapors of some Minerals, which quickly evaporate, if removed from their Springs.

Now though *Scarborough-water* will endure carriage as far as any I know, and yet retain its purging quality, even to many days or weeks, when it stinks, because of its large proportion of Mineral Salts, which are not lost by carriage, and will carry it through the Body; yet certain it is, that it suffers a great alteration and decay of vertue, being conveyed at distance; which probably must proceed from the loss of some volatil parts; whereupon are also lost some alterative properties, by which it should fortify the *Crafsis* of the Stomach and other Nervous parts, or open Obstructions, or expel the Stone, &c: And thence it is, that I never saw a good cure done by it at distance.

distance. Nor can it be supposed, that these waters, which have in them a Body of Mineral Salts, can want those Volatil Spirits, which others possess, that have no Minerals at all. Nay its plain, that even *Scarborough*-water being drunk at the Town, which is but a quarter of a mile from the Spaw, hath nothing so pleasant a relish upon the palat, as it hath at the Fountain (and some observe, its not so operative:) But whether that Alteration come from a sudden loss of any Spirits, I shall not hastily determin, but do rather chuse to make it out thus: It is such an Alteration as we observe in Wine or Ale, which, after a while, looses the briske taste or relish, which it had being new drawn out of the Cask, whereby it is not so grateful to the Palat, while yet perhaps there is little or no loss of any Vinous or Frumental Spirit; but then, after a day or two, it becomes whitish in Colour, and suffers some degrees of Putrefaction: Notwithstanding I could never discern it to loose of its quantity, as *Frambesarius* and *Van Heer* do affirm concerning the *German*, as I have cited them p. 101. of my Answer.

Now, that I may yet more fully make out the truth of what I have asserted about the Principles of *Scarborough-Spaw*, I here present to your view these several parts of it, with the manner of Extraction.

As touching the Vitriol, I must refer you to my Book, where I hope I have sufficiently proved it to be one of them, especially to p. 42, 43, 44; since, it being *there* principally in its Volatil parts, it cannot be so especially represented to the senses at distance, while yet it is most conspicuous at the Well.

After Distillation or Evaporation of the Water, taken clear out of the Fountain, and strained from all fabulous mixture, there is found that Body of Minerals, signed A, *viz.* an ounce in five quarts, and in dry years, 10 drachms: Which I take to be the Product of the five Minerals, *Iron, Vitriol, Alome, Nitre* and *Salt*, which the water is impregnated withal, and seems to have a compound taste of sharpe Salt, acid, and somewhat stiptick; and indeed a *tertium* diverse from them all.

Dissolve this body of Minerals in pure Spring-water, or distilled water, and then filter it through Cap-paper, there will stay a little Insipid Earth in the filter, but the water will be
exceeding

exceeding brackish. Evaporate that water away, and there remains the body, signed B, which being duly prepared, and time allowed (which I now have not) I have sometimes seen to shoot into *stiria's* an inch long, being set to Chrystallize in a cold Cellar. This I Judge to be, for the greater part, *Niter*, resembling much in taste that *Niter*, which breaks out upon the Cliffe near the Well, mentioned p. 106. of my Answer.

Dissolve again this Body in distilled water, and filter it, and the water shall be very brackish, but there shall remain in the filter the powder, signed C, which seems to be the *Aluminous* part: This is sometimes found to be like a Chrystallin sand, as you have it in the paper, signed C C; I think, the difference in the shooting ariseth from the different degrees of heat, which is given it. Evaporat this water away, and you have a *Salt*, mark't D, or that (D D ;) the difference betwixt them is in the degrees of heat: In both which, if you note it, there are some small *stiria*, which I take to be the *nitrous* particles interspersed. This I have sometimes depurated, till it hath become as white as Chalk, and yet retained its Saltnefs, as you have it signed D D D. Now, whether this Salt be from the Sea, or rather the Salt of all the minerals, I shall leave it to others to Judge; My opinion is, that it is nothing else than the product of the Minerals, which yet may receive some small addition from the Sea.

When the *Spaw*-water is first set upon the fire, there falls to the bottom a yellowish powder, which if that water be filtred, stays behind, mark't E: whether this be the same with the *Ochre*, that is found in the bottom of the vessel, when the water is conveyed at distance, I cannot say; but they are both of a colour.

Here I had thought to have sent you the *Black sediment* (mentioned p. 66. of my Answer) which falls to the bottom of the vessel, after the water hath received a tincture from the Gall, which also calcineth of a dark brown colour, which I take to be the *Iron Mineral*; but it being hard frosty weather, when I was last at *Scarborough*, it would not separate. If you desire it, I shall supply it in Summer.

Now because my Adversary hath made a great ruffle about
the

the Calcining of the Minerals, which he saith is White, and thereupon endeavors to exclude *Vitriol* and *Iron* from their number; I have sent you some of them calcin'd, as they came out of the Crucible, signed F, which, you may see, have a manifest appearance of a red colour, (to use his own expression, whose words I have cited p. 57. of my Answer:) Now since this Colour cannot be supposed to come from *Niter*, *Alom*, or *Salt*, it must, even upon his own principles, come from *Vitriol*, or *Iron*; and I judge it to come from *Iron*, which is there in its body.

And if you take the body of Minerals, which we first spake of to be found in the *Spaw-water*, and calcine it, and so rub it into a fine powder, and then edulcorate it in pure or distilled water, and afterwards filter it, you shall find a nitrous Salt, not much different from what was expressed before, mark't B, and the other following parts also; but a larger quantity stays always in the filter, chrystallized through the more vehement heat of the fire.

But there are other parts, which I fetch out of this body of Minerals, which doubtless do much contribute to the Cures performed by this water, and used with other vehicles are of singular use in Hypochondriack diseases. I took six ounces of the Minerals, which I put into a Retort, and placed it in a furnace covered with Sand, increasing the fire gradually, the Receiver being close joyned to the Retort, and so luted, as not the least Volatil spirit could evaporate. *First*, came this in the Glass, signed G, about an ounce in quantity, which is the *Phlegm*. Then with another Receiver, as well luted, the heat increasing, came the acid Spirit, signed H, near half an ounce in quantity. I have sometimes found it much more sharpe and acid than this is, and indeed I took it too soon away from the fire: Yet this giveth a Tincture to a decoction of *Roses*, like Spirit of *Vitriol* or *Salt*. I have sometimes observed this sharpe spirit like Spirit of *Vitriol*, to chrystallize to the sides of the glass, when it hath been long kept, and loosing its acidity to become like the phlegm.

I now come to the *Queries* of D. Foot, to which I shall speak as to matter of fact, referring the Reason of things to be discussed by better heads.

To

To the *first*, I distilled *Scarborough* Spaw-water in a Glass-still, luting the Receiver so close, that no spirit (even of wine) could escape me, and it yielded nothing but an insipid water, as ordinary Spring-water uses to do : And I think, I may confidently affirm, that none of those Mineral Springs will afford any other.

To the *second*, The water of *Scarborough*, and all such as are impregnated with a body of Minerals, whether they be let stand, or conveyed at distance, do let fall a yellowish sediment in time. But so it is not in *Knaresbrough* sweet-well, nor such others as have no Minerals, but have onely imbibed the Vapors or Odors of some Mineral.

To the *third* ; When such waters are moved by carriage, they do sooner precipitate that yellow sediment to the bottom, and especially if conveyed in oaken vessels.

To the *fourth* ; This yellowish sediment is plainly discernable both in their Spring-heads and streams; nay, even *Knaresbrough* water doth a little colour the Cistern in tract of time, notwithstanding it hath very little of the substance.

To the *fifth*. Those bottles that are stop'd close, whether they be moved or not, will longer keep their brisk relish, than such as are left open, and also longer retain their medical vertues, together with their colour and sediment.

To the *sixth* ; I find not any difference in the Vessels, wherein *Scarborough*-water is put, viz. a Glass-bottle or an Ox-bladder, save this, that that which was in the Bladder would not receive so black a tincture from the Gall, as the other, but rather a Claret.

To the *seventh* ; I could never yet devise, nor any other I have met with, to prevent the loss of the aperient vertue of *Scarborough*-water, nor to hinder the precipitation of the yellow sediment, if removed at distance.

To the *eighth* ; Notwithstanding that *Scarborough*-water lets fall the *Ochre*, yet it remains Purgative, from the rest of the Mineral Salts and Spirits, which yet it retains even till, and when it stinks : And perhaps being fetid it may purge the more, as some have told me, who have drunk it, when they have been forced to stop their noses, though it hath been with very much prejudice to their health, as I have made out in my former Book, to wit *Scarborough-Spaw*, (Edit. 2. p. 220, 221.) But as for *Knaresbrough* Sweet-well, that will be found enervated, though no *Ochre* appear in the bottom.

To the *ninth* ; That of *Knaresbrough*, and such like, are better explicated, to have lost their vertues by an Avolation of Spirituous parts, since they have nothing else wherein the vertue can consist : whereas it will not serve for *Scarborough*, from which these spirits cannot in reason be excluded; nay they are found more eminently in the Minerals. And therefore we must allow to it, and to such like, an intestine Alteration, or Precipitation

of their parts, or some such Expression, which I refer to the Learned to consider of.

I now pass on to speak a few words concerning the 3. Chymical maxims, quoted by D. Foot. It is very true, that great Medical vertues do consist in the Volatile Sulphurs of Metals and Minerals; yet we may not exclude their fixed parts from their use in Physick, as the fix'd Salt of Steel, and even Steel it self we use with good success. And *Schroderus* hath a great many singular good medicins, which he prepares even out of the fix'd salts of all the Metals and Minerals.

That which he observes in the second, *viz.* That Acids and Alcalies mutually operate upon one another, even to an utter amission of their former activities, and a production of a *tertium neutrum*; as it is very true, so it is sufficiently verif'd in these Minerals, wherewith these waters of *Scarborough* are impregnated: for they are become a quite other thing to what they are in their principles, agreeing in some things with them, and yet disagreeing in other things, as I have made out p. 18, 19. and again p. 61. 62. so far as was pertinent to my purpose.

Concerning the *third*, there is no doubt to be made of its verity: And as to the *Hypothesis*, he draws from the said Premises, I have had occasion particularly to speak to it, p. 5, 6. and again, p. 17, 18. and therefore I shall say no more of it here, but pass on

To the *Numb.* 56. p. 1128. which obligeth me to say something, and that is to a Letter from Dr. *Higmore*; to which Gentleman I am very much obliged for his Candour in owning any advantage I have gotten of my Adversary: though he saith, being a Stranger to the Water, he cannot judge, whether either of us hath gotten the right of his side; and he doubts, whether some of the Mineral principles may not be left out.

I have made it appear, that my Antagonist, after all his severe denials of the Minerals I asserted to be in the Water, doth at last in his own Book assent to them all, p. 112, 113, of my Answer. And I cannot take it unkindly, that Dr. H. or any other Learned and Ingenious Gentleman, that designs not to quarrel (as he saith) should for satisfaction ask further questions about it. The Doctor is a stranger to this water, yet hath my Reasons for all the Minerals, (besides my Adversaries concessions,) none of which I could leave out. If he or any other Ingenious person, that is not yet satisfied, would be at the paines to take a view (if these parts of the water, which I herewith present to your view, be not enough) I doubt not but they would return to my opinion.

Next, he wonders, why I mention *Alome* among the rest, which (he saith) *exiccat, adstringit, incrassat*; and he understands not, how this water should be so highly deopplative, and beneficial to Hypochondriacal and Cachectical persons, being impregnated with so great an Astringent, neither (saith he) doth the Dr. declare.

By

By this, as also by what follows it appears, that Dr. *H.* did read my Book, while I treated of the Minerals, very superficially, or else had much forgotten when he writ that Letter. Nothing is more plain, than that our Water hath imbibed *Alome*, inasmuch that Mr. *S.* in the former part of his Book, against me owns nothing else almost but *Alome*. And for the *adstringent*, &c. property of *Alome*, it is very true, what Dr. *H.* saith, to which I have also spoken expressly, p. 126, 127. of my Answer, and plainly proved, that it can neither open Obstructions nor loose the Belly, *from thence*. But I have fully evinced, that all the rest are there as well as *Alome*, and treated of them all, and their properties, communicated to this water, in my first Book, viz. *Scarborough-Spaw*, Edit. 2. p. 142, 143, 144, 145. Besides that I have in the several places of my latter Book touched upon their virtues, as *Vitriol*, p. 71, &c. *Iron*, p. 75, 79. *Niter*, p. 85. *Salt*, p. 86. And again more fully of them all, p. 130, 131, 132. So that I have plainly declared both negatively, that it cannot have these properties from the *Alome*; and also affirmatively, from whence it hath them, onely from the Stiptick and Astringent properties of the *Iron* and *Alome* it is, that this water, though it be purgative, yet never runs the body into Dysenteries. As to the tinging with Gall (which he mentions) I have proved *that* to proceed from the *Vitriol*, and that neither *Alome* crude nor calcined, nor any of the other, do communicate that property to the water; excepting in one place of this Cliffe near the *Spaw*, where a little *Alome*-stone, that lyes in the *Vitriolin* Juyce, which breaks out about the breadth of an hat, will give a tincture with Gall, as the Earth also in that spot will do, because 'tis impregnated with *Vitriol*; but all the 200 loads of *Alome*-Earth besides, that are in the Cliffe, will not do it, neither crude nor calcin'd.

Again, the Doctor wonders, why I make *Iron* and *Vitriol* two distinct Constituents of this water, and call it *Ferrum Vitriolatum*, inferring that *Iron* and *Vitriol* are both one, and not two distinct Minerals.

These are my Adversaries objections in his Book, to which the Doctor is not aware that I have given answer: To the *Former*, p. 5, 6. viz. that I might distinguish it from *Vitriolum Cupreum*, which is Emetick. To the *latter*, I have been larger as the matter required, and have given, I think, satisfactory reasons from p. 35, to 41. and clearly prov'd, that they are not the same thing. But as these Gentlemen will have *Vitriol* and *Iron* to be one thing, so I finde Dr. *Jorden* (cap. 7. of *Nat. Baths*) making a doubt, whether *Alome* and *Vitriol* be distinct *in specie*: so that by this reckoning it might have sufficed for all, to have mentioned any of the three, and I might have saved my self some labour. But I suspect, I should not so have satisfied the most part of Learned men, in so confounding three of the principles, but might have expected a more just and severe reproof for it.

Next, Dr. *H.* observes, that I have said, that *Vitriol*, which is found

alone upon the Rock will, by the Summer heat be turn'd into *Iron*, and then he makes inference upon the *Hypothesis*. Which is a mistake; for I do not say so in any part of my Book; but p. 45. I do say, that some of that which is like ordinary Earth, falling down, turns to an *Iron-stone*, and is fusible in the fire.

In the next Sect. he is positive about the colour of *Roman Vitriol*, which I said to be factitious. Concerning this, I find Authors much differing. *Galen* (19. de simpl. med. fac.) mentions 3. sorts which he found at *Cyprus*, and tells of a *green* sort, but not a word of *blew*. So Dr. *Jorden*, c. 7. Indeed *Schroderus* and *Adrian Toll* speak of a *blew* sort. In this dissent of Writers, I consulted some Learned and observing Gentlemen, who had been at *Rome*, and they assure me, that the *Romans* adde that colour, when they cast it into forms. Moreover if that be a right distribution of *Vitriols* into their several kinds, which some of our modern Chymists make, viz. that there are but three sorts, *Vitriol of Iron*, of *Copper*, and *white Vitriol*, then, I think, it will follow, that I am in the right; for, one is yellow, viz. that of *Iron*, the other green, and the white is that, which is made blew. But 'tis not worth the while to contend about it.

In my 120 p. he saith, I am dissatisfied with what my Adversary asserts concerning the Saltness of the Sea proceeding from *Fossil Salt*, &c. but rather that I allow the Peripatetick Torrefaction of the Sun to be the Cause. All I say there, is, that the *Peripateticks* thought, it came short of an adequate cause, and thereupon they fly to that torrefaction; but it does not therefore follow, that I allow it. The truth is, I like neither of the Opinions, but have Arguments against them both. To speak out, I rather think, the Saltness of the Sea to be connatural to it (as the freshness of other water is to it) and that it was made so from the beginning, but that I reserved for another discourse.

As for the Argument which there I brought to back my assertion, viz. That if the Salt of the Sea should come from *fossil Salt*, it would kill the Fish, he saith, it is not convincing. This I seconded by an Instance concerning the *Salt-Sea*, which kills all fish, and thence is called *Mare mortuum*: Which, I think, is of greater force to confirm it, than the Doctors instance of Oysters, which he has experimented to be preserved by Salt and water, can be to contradict it. For those *Zoophyta* have but a dull and imperfect life, and are not so proper to be drawn into instance in our case. We know, they will keep a long time in their own pickle or moisture, and we have also known them to sink, notwithstanding the addition of Salt and water, and therefore little judgment can be taken from them. It is most certain (as he observes) that the Inland Salt-springs are such from fossil Salt, and it were worth trying, whether those Salt-springs would not kill a *Pilchard*, or any other sort of Sea-fish, that liveth a perfect sensitive life: but, I fear, Sir, I have been too tedious. You will, &c.

An